User manual

MES106/110 Managed ethernet switch

The Teleste MES106/110 is a layer 2 industrial Ethernet switches designed with 6/8 Fast Ethernet ports and 2 Gigabit or 100Mbit uplink ports to ensure high-bandwidth uplink connection for large-scale surveillance in video networks

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Safety warning

Before installation:

Read this manual completely and gather all information on the unit. Make sure that you understand it fully. Check that your application does not exceed the safe operating specifications for this unit. This unit should only be installed by qualified personnel. This unit should be built-in to an apparatus cabinet, or similar, where access is restricted to service personnel only.

The power supply wiring must be sufficiently fused, and if necessary it must be possible to disconnect manually from the power supply. Ensure compliance to national installation regulations. This unit uses convection cooling. To avoid obstructing the airflow around the unit, follow the spacing recommendations (see Cooling section).

Before mounting, using or removing this unit:

Prevent access to hazardous voltage by disconnecting the unit from power supply.

Warning

Do not open connected unit. Hazardous voltage may occur within this unit when connected to power supply. Before powering-up, a protective earthing conductor must be connected to the protective earthing terminal and have a cross-sectional area of at least 1.5 mm².

Note that this unit can be connected to two different power sources.

When this unit is operated at an ambient temperature above +55°C (+131°F), the External Surface of Equipment may exceed Touch Temperature Limit according to EN/IEC/UL 60950-1.

To reduce the risk of fire, use only No. 26 AWG or larger telecommunication line cord.

Class 1 Laser Product

Do not look directly into fibre optical fibre port or any connected fibre although this unit is designed to meet the Class 1 Laser regulations.

MES106/110 managed Ethernet switch introduction

4/8 x 10/100Base-TX IEEE 802.3 ports and 2 x 100/1000Base-FX or 2 x 100/1000Base-TX uplink ports for SFP transceivers

MES106:

Local ports (10/100 TX)

Uplink ports (100/1000 TX/FX)

MES110:

Local ports (10/100 TX)

Uplink ports (100/1000 TX/FX)

Welcome, and thank you for purchasing Teleste's CFO Products.

General

The Teleste MES106/110 are an Industrial switches made for harsh enviroments. The switches can be used in ether 100 Mbit or Gigabit networks due to a multi-rate SFP solution.

In addition to standard STP and RSTP protocols the MES switch provides an unique FRNT (Fast Recovery of Network Topology) technology is the fastest protocol on the market to re-configure a network in the event of any link or hardware failure. That is why MES is used in safety critical applications such as tunnels, traffic signal control and railway systems.

Installations in harsh environments and places with heavy electrical interference require the use of a reliable media. MES provides a number of solutions using fibre optic transceivers. Multi- or singlemode transceivers can be used to build point-to-point or redundant ring networks with ranges up to 120 km between each switch. Our BIDI transceiver, which transmits and receives data on a single fibre can be used in applications where the number of fibre cores are limited.

Real-time properties are implemented in the switch in order to achieve determinism for real time critical applications. MES supports QoS (Quality of Service) with four priority queues and strict priority scheduling as well as HoL (Head of Line Blocking Prevention). All to assure that the data network is deterministic.

Features

- Advanced switch operation for multicast video
- Compact ethernet switch design
- Advanced Layer 2 functionality
- Low power consumption
- Dual power input, wide voltage range
- Highly configurable fault I/O contact
- Robust metal DIN rail housing
- 550.000 hours MTBF to MIL-HDBK-217K
- Operational temperature -40 to +70°C, passive cooling
- Industrial EMC, shock and vibration testing
- Fast reconnect for multicast protocols

Getting started

Quick instructions

This product runs a specific operating system which provides several management tools that can be used for configuration of the unit.

- **IPConfig tool**
  This is a custom IP tool used for discovery of network switches.
- **Web**
  Configuration of the unit using the web browser.
- **CLI**
  Configuration of the unit via the Command Line Interface.
  Username: admin
  Password: teleste

If the computer is located in the same subnet as the switch you can easily use a web browser to configure the unit. Within the web you can configure most of the available functions.

For advanced network settings and more diagnostic information, please use the CLI. Detailed documentation is available upon request.

Factory default IP address: 10.9.96.30
Netmask: 255.255.255.0
Gateway: 10.9.96.1

Note! *If you are not sure about the subnet – consult your network administrator.*

Configure the unit via Web browser

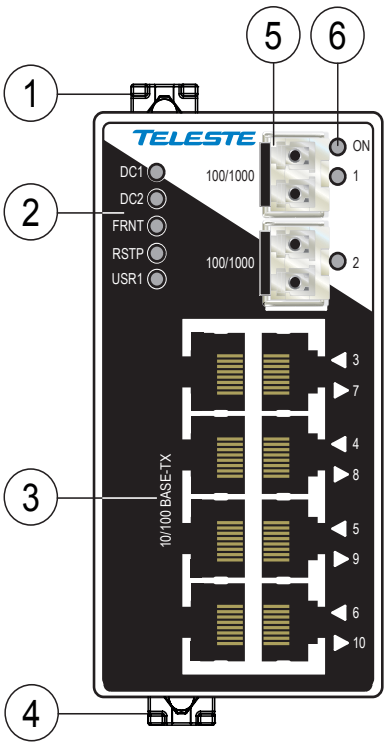
The unit can easily be configured via a Web browser.
Open the link http://10.9.96.30 in your web browser, and you will be prompted with a Login screen, where the default settings for Username and Password are:

Username: admin
Password: teleste

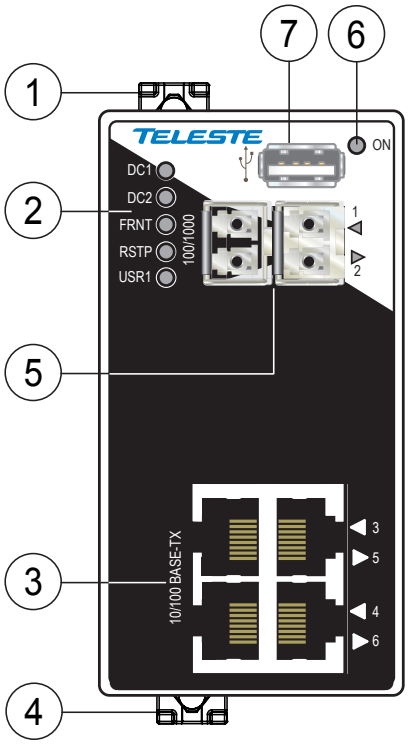
Once you have logged in, you can use the extensive integrated help function describing all configuration options. Two common task when configuring a new switch is to assign appropriate IP settings, and to change the password of the admin account.
The password can be up to 64 characters long, and should consist of printable ASCII characters (ASCII 33-126); ‘Space’ is not a valid password character.

Note! *Version of IP Config tool must be 10.3.0 or higher.*

Connections



MES110 Front panel.

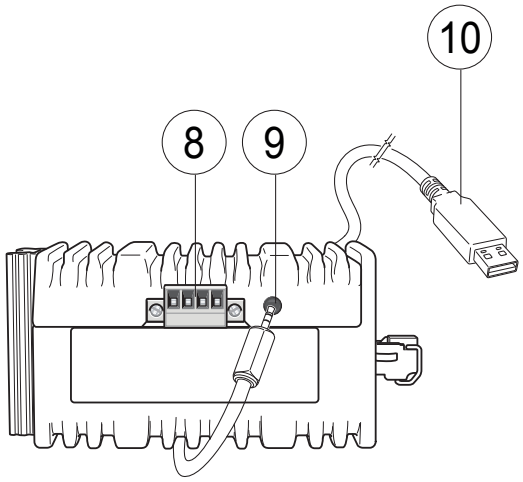


MES106 Front panel.

Ethernet switch mechanical connections

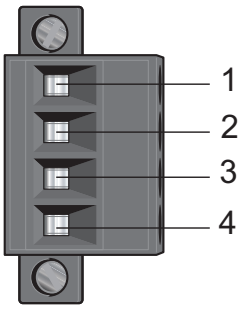
1. Power connector (4-pin detachable screw terminal).
2. Indicator leds.
3. 4/8 x 10/100Base-TX local ports (RJ-45 female).
4. I/O connector (4-pin detachable screw terminal).
5. 2 x 100/1000Base-TX or 2 x 100/1000Base-FX uplink ports for SFP transceivers.
6. Power indicator led.
7. USB 2.0 port (only at MES106).

8. I/O connector (4-pin detachable screw terminal).
9. Console port.
10. Serial management cable CIC507.



MES106/110 bottom view.

Power supply connection



Power connector, 4-pin detachable screw terminal.

MES supports redundant power connection. The positive inputs are +DC1 and +DC2, the negative input for both supplies are -COM. Connect the primary voltage (e.g. +24V DC) to the +DC1 pin and return to one of the -COM pins on the power input.

Pin number	Symbol	Description
1	+DC1	Supply voltage input DC1
2	+DC2	Supply voltage input DC2
3	-COM	Common
4	-COM	Common

Power specifications	
Operating voltage	Rated: 24 to 48 VDC Operating: 19 to 60 VDC
Rated current	240 mA @ 24 VDC 120 mA @ 48 VDC
Rated frequency	DC
Inrush current, I^2t	$22.7 \cdot 10^{-3}$ A^2s @ 48 VDC
Startup current*	2 x Rated current
Polarity	Reverse polarity protected
Redundant power input	Yes
Isolation to	All other
Connection	Detachable screw terminal
Connector size	0.2 – 2.5 mm2 (AWG 24 – 12)
Shielded cable	Not required

* External supply current capability for proper start-up

Uplink port connections

For uplink network connections the MES switches has up to two (2) 100/1000Base-TX or two (2) 100/1000Base-FX SFP transceivers.

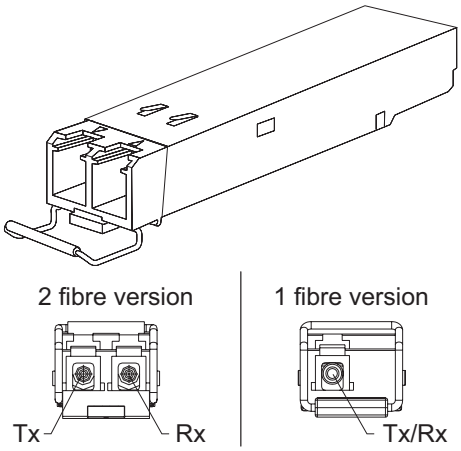
Ethernet SFP pluggable connections (FX or TX)	
Electrical specification	IEEE std 802.3. 2005 Edition
Data rate	100 Mbit/s or 1000 Mbit/s transceivers supported
Duplex	Full or Auto, depending on transceiver
Transmission range	Depending on tranceiver
Connection	SFP slot holding fibre transceiver or copper transceiver
Number of ports	1 or 2

The optical interface is a small form-factor pluggable (**SFP**)**,** see picture beside. The optics is hot-swappable. Optical cable connector in use is type **LC/PC**. The optical operation depends on the type of selected SFP transceiver module. This information is marked to the model's type sticker which is located on the side of the unit.

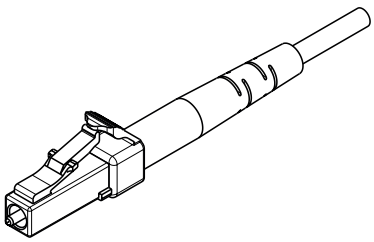
When installing the fibre optic cable, do not exceed the minimum bending radius when connecting cable to the system.

Note! *For correct optical operation and to ensure quality connections between fiber optic devices it is important that every fiber connector be inspected and cleaned prior to mating. Connectors should always be cleaned with professional cleaning equipment and accessories for fibre optics. The optical connectors on the equipment should always be protected with dustcaps when there is no fibre inserted.*

Any contamination in the fibre connection can cause failure of the component or failure of the whole system. Even microscopic dust particles can cause a variety of problems for optical connections. A particle that partially or completely blocks the core generates strong back reflections, which can cause instability in the laser system. Dust particles trapped between two fibre faces can scratch the glass surfaces. Even if a particle is only situated on the cladding or the edge of the endface, it can cause an air gap or misalignment between the fibre cores which significantly degrades the optical signal.



SFP optical transceiver module.



Optical connector is type LC/PC.

Optical connection meets class 1M laser safety requirements of IEC 60825-1: 2001 and US department of health services 21 CFR 1040.10 and 1040.11 (1990) when operated within the specified temperature, power supply and duty cycle ranges.

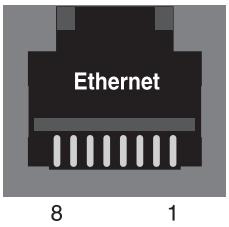
SFP Transceivers

Supported transceivers: Only Teleste MWF and MWG series SFP models are compatible with the switch. Other vendor models are usable but will create a notification. Temperature specifications are also depending on the used transeivers.

Note! *To comply with UL60950-1 only UL recognized SFP transceivers should be used.*

Deviations: With copper transceiver 1100-0148 the specified operating temperature on MES is 0 to +50ºC (32 to +122°F).

FRNT reconfiguration times can not be guaranteed with copper transceivers.



RJ-45 female Ethernet connector.

Pin	Signal (MDI)	Signal (MDIX)
1	Tx +	Rx +
2	Tx -	Rx -
3	Rx +	Tx +
4	-	
5	-	
6	Rx -	Tx -
7	-	
8	-	

Pinout for RJ-45 Ethernet connector.

Local port connections

A standard **MES106** switch comes with four (4) – 10/100Base-TX local ports (CAT5). A standard **MES110** switch comes with eight (8) – 10/100Base-TX local ports (CAT5).

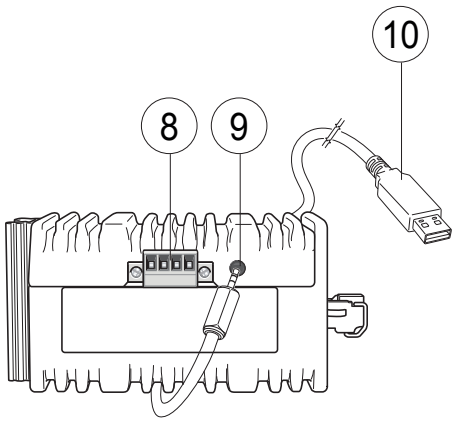
All local ports support full wire speed. This equates to 100 Mbps full duplex on every port. 100 Mbps in each direction on all ports equals 200 Mbps per port.

Ethernet TX connections	
Electrical specification	IEEE std 802.3. 2005 Edition
Data rate	10 Mbit/s, 100 Mbit/s, manual or auto
Duplex	Full or half, manual or auto
Circuit type	TNV-1
Transmission range	Up to 150 m with CAT5e cable or better*
Isolation to	All other
Connection	RJ-45, auto MDI/MDI-X
Shielded cable	Not required, except when installed in Railway applications as signalling and telecommunications apparatus and located close to rails.**
Conductive housing	Yes
Number of ports	4 (MES106) or 8 (MES110)

* Refer to Safety section.

** To minimise the risk of interference, a shielded cable is recommended when the cable is located inside 3 m boundary or the cable is longer than 30 m and inside 10 m boundary to the rails and connected to this port.

Console port connection



MES106/110 bottom view.

The console port (9) can be used to connect to the CLI (Command line interface).

1. Connect the serial diagnostic cable to the console port.
2. Connect cable to your computer USB port.
3. Use a terminal emulator and connect with correct speed and format (115200,8N1) to the assigned port.

NOTE! *For more information about the CLI, see the management guide.*

Console connection	
Electrical specification	TTL-level
Data rate	115.2 kbit/s
Data format	8 data bits, no parity, 1 stop bit, no flow control
Circuit type	SELV
Connection	2.5 mm jack, use only serial management cable CIC507

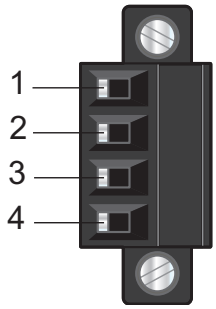
Led indicators

Led	Colour	Description
ON	No light	Power OFF
	Green	Power ON
	Red	Alarm condition
	Blinking	Switch is selected in the IPconfig tool
DC1	No light	Power OFF
	Green	Power ON and OK on DC1
	Red	Power failure on +DC1
DC2	No light	Power OFF
	Green	Power ON and OK on DC2
	Red	Power failure on +DC2
FRNT	No light	FRNT disabled
	Green	FRNT OK
	Red	FRNT error
	Blinking	Unit configured as FRNT Focal point
RSTP	No light	RSTP disabled
	Green	RSTP enabled
	Blinking	Unit elected as RSTP/STP root switch
USR1	No light	VPN disabled
	Green	At least one VPN tunnel up and OK
	Red	All VPN tunnels down
1 to 10	No light	No Link
	Green	Link established
	Blinking green	Data traffic indication
	Yellow	Port alarm and no link. Or if FRNT or RSTP mode, port is blocked.

Up-link port's leds / indicator lights.

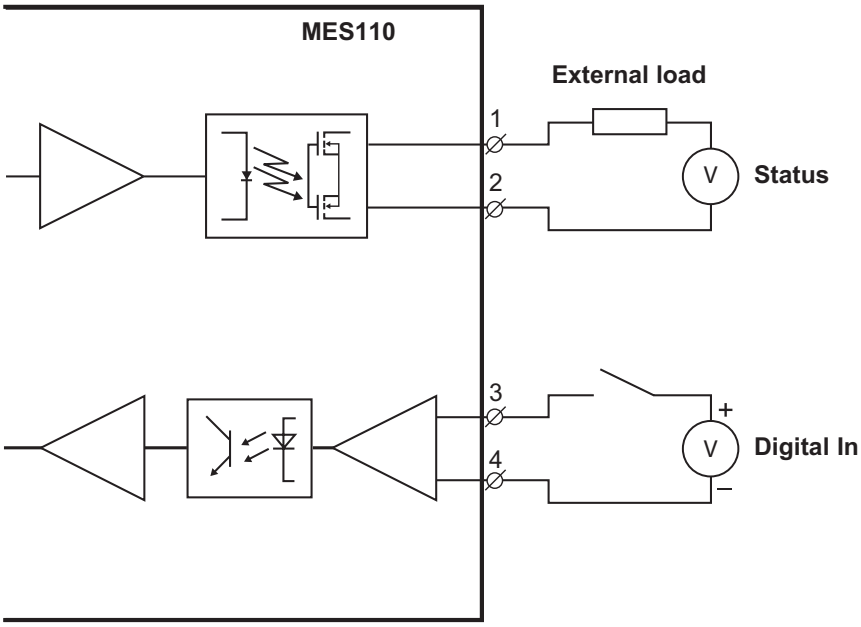
Digital I/O connection

The Status output is a potential free, opto-isolated normally closed solid-state relay. This can be configured to monitor various alarm events within the MES unit.
An external load in series with an external voltage source is required for proper functionality.
For voltage/current ratings, see Technical specifications.



I/O connector, 4-pin detachable screw terminal.

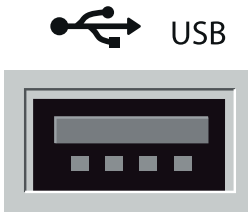
Pin number	Symbol	Direction	Description
1	Status +	Output	Alarm relay status contact
2	Status -	Output	Alarm relay status contact
3	Digital in +	Input	Digital in +
4	Digital in -	Input	Digital in -



The Digital IN is an opto-isolated digital input which can be used to monitor external events. For voltage/current ratings, see Technical specifications.

I/O / Relay output	
Maximum voltage/current	60 VDC / 80 mA
Contact resistance	Max 30 Ω
Isolation to	All other
Connection	Detachable screw terminal
Connector size	0.2 – 2.5 mm2 (AWG 24 – 12)

I/O / Digital input	
Maximum voltage/load current	60 VDC / 2 mA
Voltage levels	Logic one: >12V Logic zero: <1V
Isolation to	All other
Connection	Detachable screw terminal
Connector size	0.2 – 2.5 mm2 (AWG 24 – 12)



USB connection

On MES units equipped with a USB port, a USB memory stick can be used for automatic backup and restore. The intended application for the auto-backup function is to simplify unit replacement in case of unit failure.
Once activated, it works seamlessly. If a stick already is prepared nothing else is needed. If a unit fails you simply replace it, moving the USB stick to the replacement unit. Which must be of same mark and model. At first boot, the replacement unit automatically restores all necessary files from the faulty unit.

Note! *The auto-backup and restore function only handles configuration.It does not handle backup/restore of firmware images. You must not only ensure that your replacement unit is of the same model as the original unit. It should also have same operatig system firmware (feature) version loaded as the original unit.*

Position	Direction	Description
No. 1	Out	VBUS
No. 2	In/Out	D–
No. 3	In/Out	D+
No. 4	Out	GND
Shield	In/Out	Connected to protective earth

USB	
Electrical specification	USB 2.0 host interface
Data rate	Up to 12 Mbit/s (full-speed mode)
Circuit type	SELV
Maximum supply current	500 mA
Connection	USB receptacle connector type A

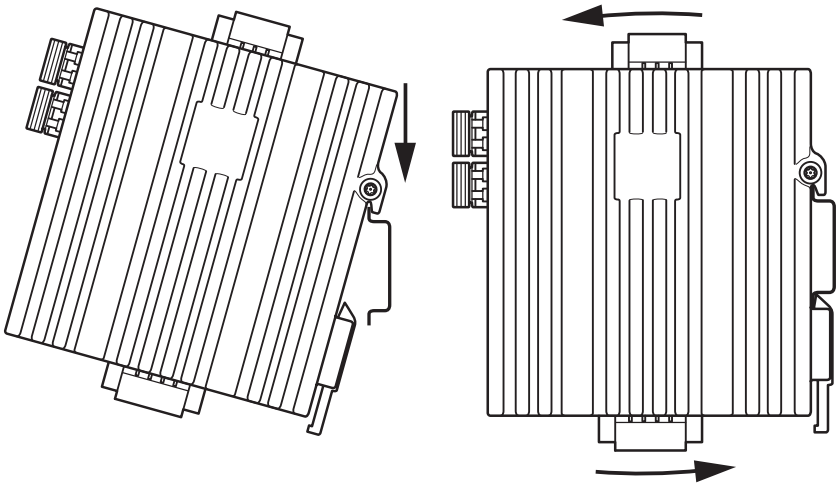
Installation

Integrated DIN-clip, back view.

Note! *It is recommended that the DIN-rail is connected to ground.*

DIN rail mount

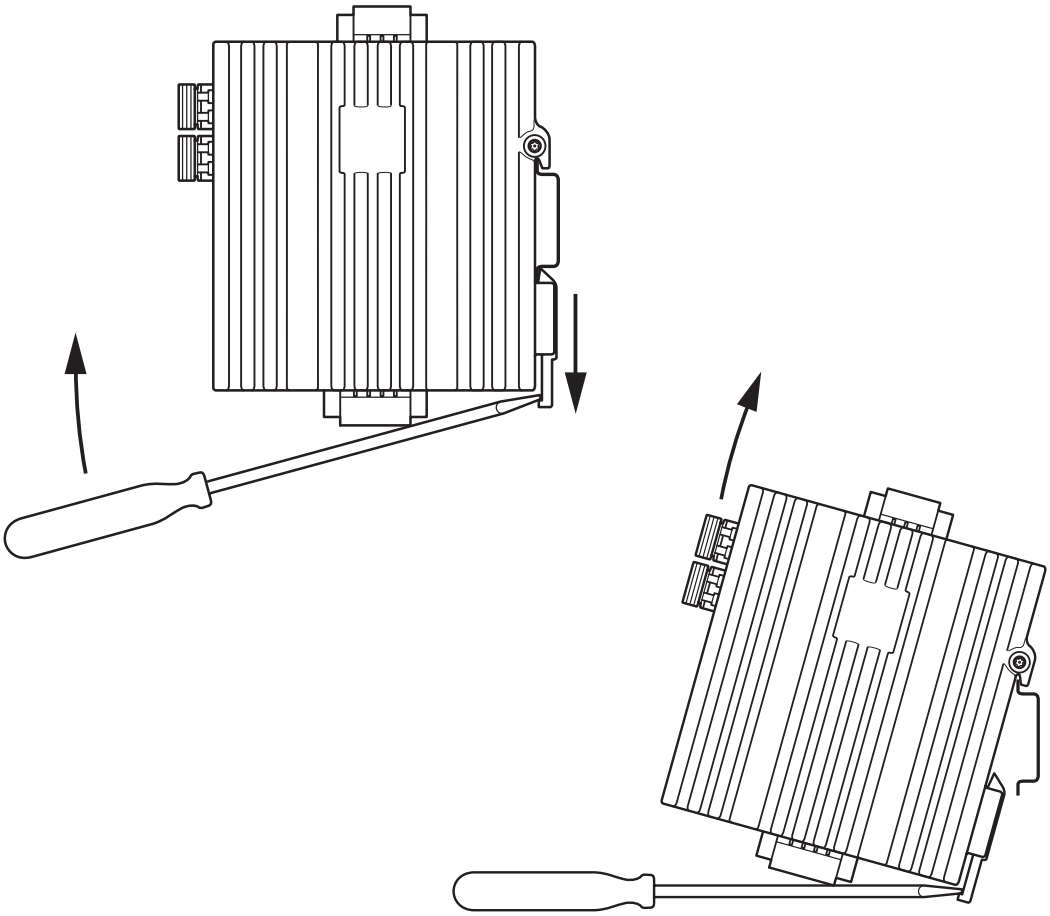
The DIN rail attachment on the back of the MES device is used to snap into the 35 mm DIN rail.



Snap on mounting with integrated DIN-clip.

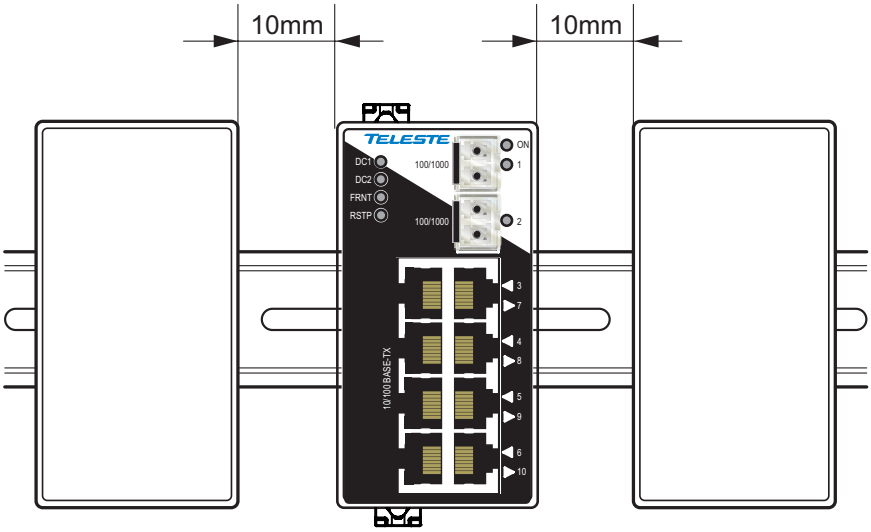
DIN rail removal

Removing MES with integrated DIN-clip. Press down the support at the back of the unit using a screwdriver.



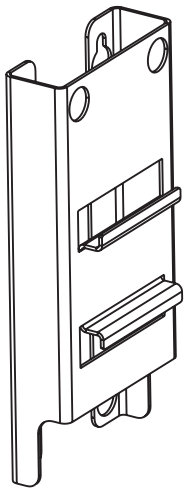
Cooling

MES unit uses convection cooling. To avoid obstructing the airflow around the unit, use the following spacing rules. Minimum spacing 25 mm (1.0 inch) above / below and 10 mm (0.4 inches) left / right the unit. Spacing is recommended for the use of unit in full operating temperature range and service life.

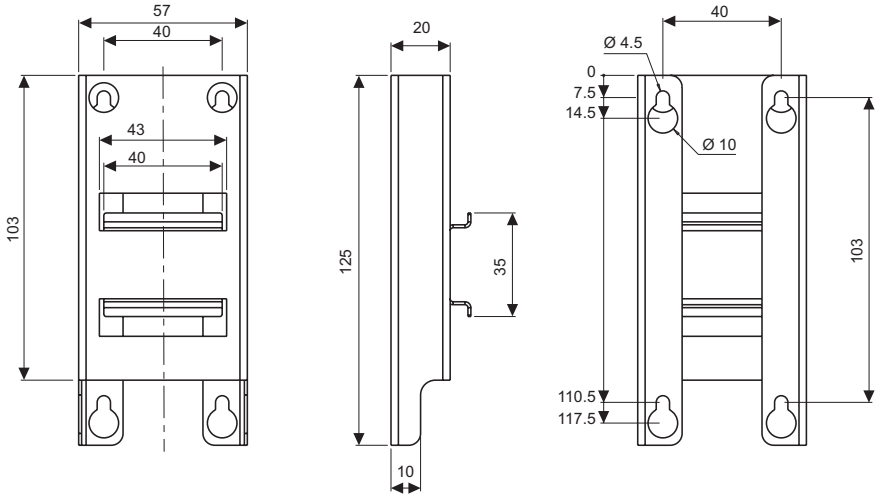


Optional wall mount

For wall mount please use optional accessory kit MAC007.
The mounting kit has a DIN rail to host a MES switch. MAC007 is mounted to the wall by means of 4 fixing screws.



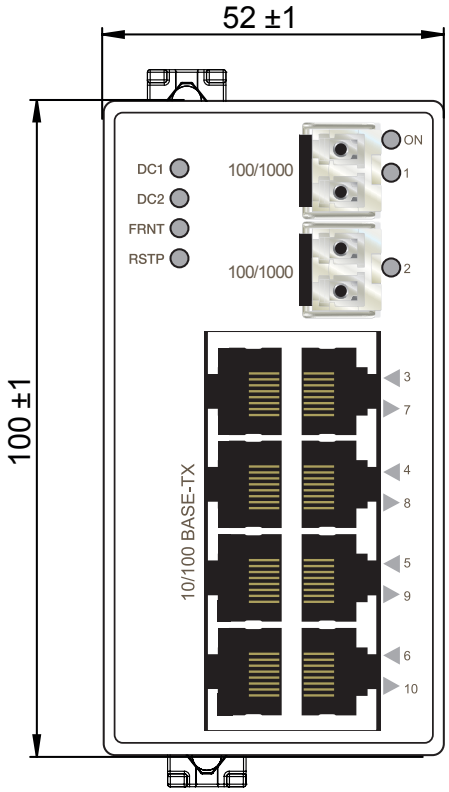
Optional mounting kit (item code CIK007)



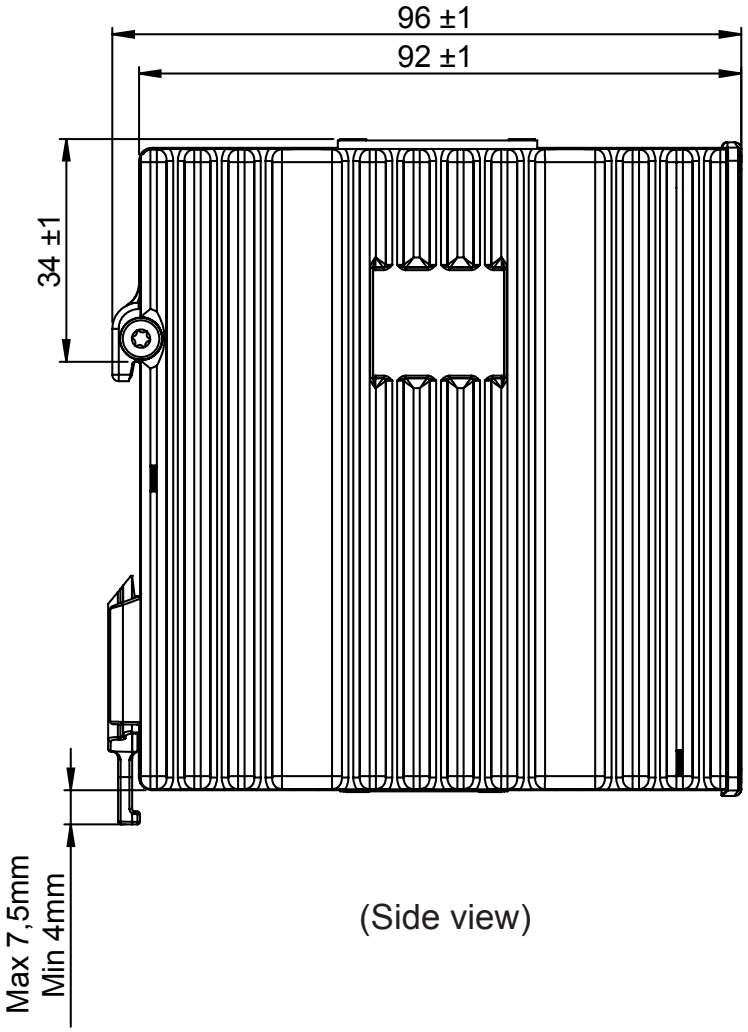
(Front view) (Side view) (Back view)

Mechanical drawing

(Example for MES110, same information applies respectively to MES106 unit)



(Front view)



(Side view)

Technical Specifications *(Typical values unless otherwise stated)*

Up-link ports (SFP)*		
Number of ports	2 pcs	
Standard	100Base-TX	CAT5/CAT5e/CAT6
	100Base-FX	MMF & SMF
	1000Base-TX**	CAT5/CAT5e/CAT6
	1000Base-FX	MMF & SMF
Connector types		
RJ-45	electrical	
simplex-LC	optical	
duplex-LC	optical	

Local ports		
Number of ports	8 pcs	MES110
	4 pcs	MES106
Standard	10/100Base-TX	
Connector type	RJ-45	electrical

Protocols		
802.3	10Base-T	
802.3u	100Base-TX, -FX	
802.3ab	1000Base-T	
802.3z	1000Base-SX, -LX	
802.1q	VLAN	
802.1d	STP	
802.1w	RSTP	
802.1p	QoS	layer 2
802.3p	QoS	layer 3 (IP ToS)
802.3x	flow control	
IGMP	version 1, 2 & 3	
FRNT v0	redundant ring	proprietary protocol
SNMP	version 2c	
DHCP		IP address adquisition

Management	
WebUI	local via ethernet port & remote via network
SNMP	remote via network

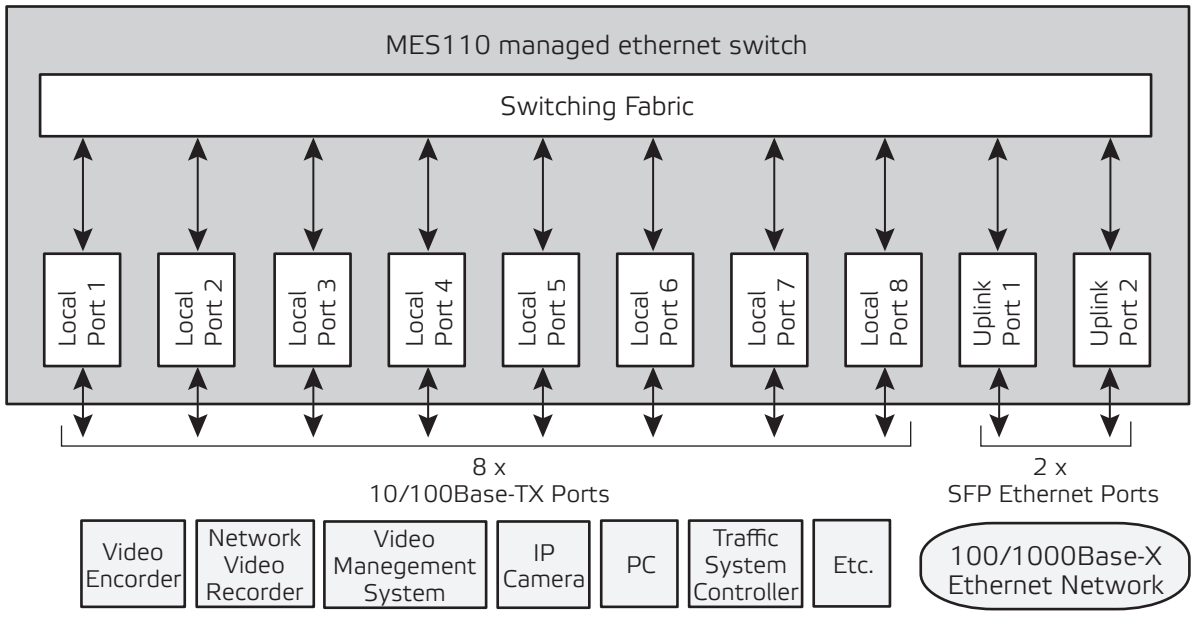
General		
Supply voltage	19...60 V DC	nominal 24 V DC
Power consumption	6 W	at 24V DC
PSU connector type	4-pin removable screw terminal	
Dimensions (H x W x D)	100 x 52 x 101 mm (3.93 x 2.04 x 3.97")	
Weight	0.7 kg (1.54 lbs)	
Degree of protection	IP 40	
Housing	DIN-rail mount	
MTBF	550 000 h	MIL-HDBK-217F
Operating temperature	-40...+70 °C (-29...+165 °F) temperature hardened	
Storage temperature	-50...+85 °C (-40...+176 °F)	
Humidity	95 %	non condensing
Vibration	IEC60068-2-6 (sine)	
Shock	IEC60068-2-27	
Damp heat	BS2011 p2.1	
EMC compatibility	EN61000-6-1, Immunity residential environments EN61000-6-2, Immunity industrial environments EN61000-6-4, Emission industrial environments EN55022 +A1, Emission IT equipment EN55024, Immunity IT equipment FCC part 15 class A EN50121-4, Railway signalling and telecommunications apparatus IEC62236-4, Railway signalling and telecommunications apparatus	
Safety	UL/IEC/EN 60950-1, IT equipment	
Marine	DNV standard for certification no. 2.4	

Notes

* To be ordered separately, please check available models from MWF and MWG series.

** If your existing CAT5 cable was installed before 1995, make sure that it has been fully tested for use with 1000Base-TX.

Block diagram *(Example for 10-port model)*



Safety

Safety warning

Do not open connected unit. Hazardous voltage may occur within this unit when connected to power supply.
Note that this unit can be connected to two different power sources.
When this unit is operated at an ambient temperature above +55°C (+131°F), the External Surface of Equipment may exceed Touch Temperature Limit according to EN/IEC/UL 60950-1.
To reduce the risk of fire, use only No. 26 AWG or larger telecommunication line cord.

Maintenence

No maintenance is required, as long as the unit is used as intended within the specified conditions.

Agency approvals and standards compliance

Type	Approval / Compliance
EMC	EN 61000-6-1, Immunity residential environments
	EN 61000-6-2, Immunity industrial environments
	EN 61000-6-4, Emission industrial environments
	EN 55022 +A1, Emission IT equipment
	EN 55024, Immunity IT equipment
	FCC part 15 Class A
	EN 50121-4, Railway signalling and telecommunications apparatus
	IEC 62236-4, Railway signalling and telecommunications apparatus
Safety	UL/IEC/EN 60950-1, IT equipment
Marine	DNV Standard for Certification no. 2.4

FCC Part 15.105 Notice: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules.
These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Corrosive environment Notice: This product has been successfully tested in a corrosion test according to *IEC 60068-2-60, method 3*. This means that the product meets the requirements to be placed in an environment classified as *ISA-S71.04 class G3*.

Note! *If the product is placed in a corrosive environment, it is important that all un-used connector sockets are protected with a suitable plug in order to avoid corrosion attacks on the gold plated pins in connectors.*

Factory default settings

Factory default on MES106 and MES110

It is possible to set the unit to factory default settings by using two straight standard Ethernet RJ-45 cables.

1. Power off the switch and disconnect all Ethernet cables (copper and fibre).

2. Connect one Ethernet cable between Ethernet ports 3 and 6, and the other between Ethernet ports 4 and 5 (MES106).
2. Connect one Ethernet cable between Ethernet ports 3 and 10, and the other between Ethernet ports 6 and 7 (MES110).
   The ports need to be connected directly by an Ethernet cable, i.e., not via a hub or switch. Use a straight cable – not a cross-over cable – when connecting the ports.

3. Power on the unit.

4. Wait for the unit to start up. Control that the ON LED is flashing red.

The ON LED flashing indicates that the unit is now ready to be reset to factory default. You now have the choice to go ahead with the factory reset, or to skip factory reset and boot as normal.

• Go ahead with factory reset:
  Acknowledge that you wish to conduct the factory reset by unplugging the Ethernet cables. The ON LED will stop flashing.
  This initiates the factory reset process*, and the unit will restart with factory default settings. When the switch has booted up, the ON LED will show a green light, and is now ready to use.

• Skip the factory reset:
  To skip the factory reset process, just wait for approximately 30 seconds (after the ON LED starts flashing RED) without unplugging the Ethernet cables. The switch will conduct a normal boot with the existing settings.

  **** Note!** Do not power off the unit while the factory reset process is in progress.*

Type tests and environmental conditions

Environmental phenomena	Basic standard	Description	Test levels
ESD	EN 61000-4-2	Enclosure	Contact: ±6 kV Air: ±8 kV
Fast transients	EN 61000-4-4	Power port	±2 kV
		Signal ports	±2 kV
		Earth port	±1 kV
Surge	EN 61000-4-5	Power port	L-E: ±0.5 kV, 12 Ω, 9 µF L-L: ±0.5 kV, 2 Ω, 18 µF L-E: ±2 kV, 42 Ω, 0.5 µF L-L: ±2 kV, 42 Ω, 0.5 µF L-E: ±2 kV, 12 Ω, 9 µF L-L: ±1 kV, 12 Ω, 9 µF
		Signal ports	L-E: ±1 kV, 2 Ω L-E: ±2 kV, 42Ω, 0.5 µF
Power frequency magnetic field	EN 61000-4-8	Enclosure	300 A/m; 0, 16.7, 50 Hz
Pulsed magnetic field	EN 61000-4-9	Enclosure	300 A/m
Radiated RF immunity	EN 61000-4-3	Enclosure	10 V/m @ (80 – 800) MHz 20 V/m @ (800 – 1000) MHz 10 V/m @ (1400 – 2100) MHz 5 V/m @ (2100 – 2500) MHz 1 V/m @ (2500 – 2700) MHz 1 kHz sine, 80% AM
Conducted RF immunity	EN 61000-4-6	Power port	10 V, 80% AM, 1 kHz; (0.15 – 80) MHz
		Signal ports	10 V, 80% AM, 1 kHz; (0.15 – 80) MHz
		Earth port	10 V, 80% AM, 1 kHz; (0.15 – 80) MHz
Radiated RF emission	EN 55022	Enclosure	Class A
	FCC Part 15		Class A
Conducted RF emission	EN 55022	Power port	Class B
		Signal ports	Class B
Dielectric strength	EN 60950-1	Power port to all other ports	1.5 kVrms, 50 Hz, 1 min
		Signal ports to all other ports	1.5 kVrms, 50 Hz, 1 min

Environmental	Basic standard	Description	Test levels
Temperatures		Operating	–40 to +70°C (–40 to +158°F)*
		Storage and transport	–50 to +85°C (–58 to +185°F)
Humidity		Operating	5 to 95 % relative humidity
		Storage and transport	5 to 95 % relative humidity
Altitude		Operating	2 000 m / 70 kPa
Service life		Operating	10 year
Reliability prediction (MTBF)	MIL-HDBK- 217F	Operating	587 000 h
Vibration	IEC 60068-2-6 (sine)	Operating	3 – 13.2 Hz: 1mm 13.2 – 100 Hz: 0.7 g 5.5 – 30 Hz: 1.5 g 30 – 50 Hz: 0.42 mm 50 – 500 Hz: 4.2 g**
Shock	IEC 60068-2-27	Operating	30 g, 11 ms 100 g, 6 ms**
Bump	IEC 60068-2-27	Operating	10 g, 11 ms

Packaging	Basic standard	Description	Test levels
Enclosure	EN 60950-1	Zinc	Fire enclosure
Dimension W x H x D With connectors			52.5 x 100 x 101 mm 52.5 x 119 x 101 mm
Weight			0.7 kg
Degree of protection	EN 60529	Enclosure	IP 40
Cooling			Convection

** Refer to “Safety” section.
** Might require Ethernet cables to be fastened close to the unit.

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